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AN EVALUATION OF PROPOSED DWARF MISTLETOE CONTROL PROJECTS PINEDALE RANGER DISTRICT, BRIDGER-TETON NATIONAL FOREST

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INTRODUCTION

Lodgepole pine stands on the Pinedale Ranger District, Bridger-Teton National Forest, were evaluated for proposed dwarf mistletoe suppression projects on September 16-18, 1986. The areas surveyed are located 8 miles west of Union Pass in Fremont, Sublette, and Teton Counties, in Wyoming near Buffalo Meadow, Raspberry Creek, Strawberry Creek, Leeds Creek, and South Fork Fish Creek (Figure 1).

OBJECTIVES

The objectives of this evaluation are to provide recommendations for minimizing lodgepole pine (LPP) (Pinus contorta) losses to dwarf mistletoe (DM) (Arceuthobium americanum).

METHODS

The lodgepole pine regeneration units were walked through and visually surveyed for the presence of DM infected overstory and understory trees, and regeneration. Dwarf mistletoe rating (DMR) (Hawksworth 1977) of infected trees and the presence of other insect and disease pests were noted.

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EXPERIMENT STATION

RESULTS

In general, lodgepole pine comprises 75 to 90 percent of the timber volume. Engelmann spruce, subalpine fir, and limber (or whitebark) pine make up the remainder. Most of the 15 units surveyed are at least 20 acres in size and the regeneration is 1 to 10 years old. Four of the units contained DM infected residuals. Small areas in two units have heavy DM infection and could be canditates for stand destruction. Unit specific recommendations are presented in the section on Management Recommendations.

The LPP surrounding the units shown in Figure 1 have a DMR of 3 or greater. In unit 16 (Compartment 025/Stand 2, not shown in Figure 1.), lodgepole pine trees with brooms, thought to be infected by DM, were infected by comandra blister rust or were stimulated by increased sunlight from opening up the stand. White pine blister rust and dwarf mistletoe were found on limber pine. Limber pine should be treated as a non-host species to lodgepole pine DM.

BIOLOGY OF PESTS

Dwarf Mistletoe (A. americanum). These parasitic seedbearing plants establish themselves on the younger stems and branches of the host tree. Dwarf mistletoes are dioecious (male and female parts are on separate plants), perennial, and live only as parasites on living conifers. They absorb water, dissolved minerals, and photosynthates from the phloem and outer xylem tissues of the host tree. The principal host of this species is Pinus contorta, lodgepole pine, but infections are occasionally found on P. albicaulis, whitebark pine; P. flexilis, limber pine; P. aristata, bristlecone pine; and P. ponderosa, ponderosa pine.

Dwarf mistletoe spreads locally from tree to tree and to parts of the same tree by expulsion of seeds from mature fruits (berries). Most seeds fall within 10 to 15 feet (90 percent within one half chain (33 feet)), but can reach distances of up to 60 feet of the source tree. Spread is most efficient and rapid from an open infected overstory to a vigorous understory, and slower through single-storied stands at a rate of about 1 to 2 feet per year. Long distance spread may result from seed transport by birds and mammals.

The life cycle is 3 to 6 years from seed dispersal, germination, infection, establishment of new plants, flowering, to seed dispersal. Detection of incipient infection is difficult. Latent infections on healthy looking regeneration can appear 3 to 6 years after the host tree is removed. After all or a large part of an overstory is removed, the increased sunlight causes suppressed infections in the understory to flourish and intensify. Dwarf mistletoe development depends directly on the vigor of the host tree; the more vigorous the tree, the more vigorous the mistletoe. When the tree dies the mistletoe dies.

Dwarf mistletoe-infected trees can be recognized through a variety of host plant characteristics such as witches' brooms, cankers, swellings, basal cups, and other abnormalities on the trunk and branches. The dwarf mistletoe plants

are visible on infected parts. Where the parasite has been present for a long time, the stand may give the impression of poor site conditions. The stand will contain deformed, stunted, spike-topped, dying, and dead trees.

Damage by dwarf mistletoe falls into five general categories: reduced increment, lower timber quality, reduced seed production, increased mortality, and indirect losses. Indirect losses include increased susceptibility to insect attack, root diseases, and storm damage.

Comandra blister rust (Cronartium comandrae). Comandra blister rust is a serious canker disease of two and three needle pines in North America. The fungus C. comandrae has a complex life cycle which includes alternating to the bastard toadflax or comandra. The fungus requires living hosts to survive. It grows perennially in the living bark of pines and develops annually on stems and leaves of comandra. Spores produced on comandra infect pine through stomates on needles and succulent shoots from mid-summer to early fall. Perennial infections on pine produce spores in the summer which can infect the alternate host plants. Pines of all sizes and ages can be infected by C. comandrae, but seedlings are the most susceptible and can be killed within a few years by stem cankers.

Cankers on older trees may take as long as 50 years to girdle the stem. Infection and subsequent top-kill leads to growth loss and predisposition to other damaging agents (s. a. root diseases or bark beetles). Stimulation brooms below the girdle are easily confused with witches' brooms caused by dwarf mistletoe infection. Local epidemics of comandra rust occur during periods of suitable (mild/wet) summer weather in areas where comandra and lodgepole pine exist in close proximity.

White pine blister rust Cronartium ribicola. This rust alternates between pines (limber pine, Pinus flexilis; bristlecone pine, P. aristate; whitebark pine, P. albicaulis; and western white pine, P. monticola) and currents and gooseberries, Ribes spp. Conditions most favorable for germination of blister rust spores are a temperature range of 50 to 60 degrees F. and a relative humidity at 97 to 100 percent for a period of about 48 hours. The spores infect the needles and the fungus grows under the bark up and down the branch or trunk producing a spindle-shape canker. As the fungus invades living tissues it kills them and eventually the affected branch or trunk is girdled and dies. Numerous cankers may defoliate a tree by killing all the needle-bearing twigs. Cankers and flagged limbs occur more commonly in the lower part of the crown, but where conditions are highly favorable for rust development, all parts of the crown may be infected.

Stimulation brooms. These are the most common non-mistletoe brooms in lodgepole pine. These brooms are usually denser than DM brooms and will not have DM shoots or basal cups. They occur in formerly suppressed trees with few branches or trees with dead or injured crowns and are most common in residual

trees left in cutover areas. The brooming is a result of increased growth concentrated in the remaining branches. Trees with brooms in the immediate vicinity of DM infected LPP should be considered infected.

MANAGEMENT RECOMMENDATIONS

It is Regional policy to take full advantage of timber sales, timber stand improvement programs, and reforestation programs to prevent or reduce resource impacts from DM. Because of the biology of DM, effective levels of management can be achieved by the orderly application of existing control procedures and techniques with standard silvicultural practices. Prevention is the principal means of reducing losses.

Clearcutting is the best way to control DM in mature lodgepole pine. This treatment should include the removal of all merchantable and non-merchantable LPP trees over 3 feet tall or the sanitation value of the operation will be lost. Trees over 3 feet could have latent or suppressed infections not visible at the time of treatment. The DM from the infected trees will continue to infect the remaining and future trees.

Clearcut units should be greater than 20 acres and regular in shape to maximize the area/perimeter ratio to prevent rapid reinvasion from infection sources on the edges. This is important for units where the stands surrounding the clearcuts cannot be cut until the regeneration is tall enough to provide suitable wildlife hiding cover (90 percent of the animal hidden from view at 200 feet). The Forest Plan states that in the most critical wildlife habitats, the recommended size for clearcuts in LPP is 15 acres. Clearcuts of this size or smaller would allow DM to infect a large portion of the unit from surrounding stands.

A circular clearcut without islands or peninsulas of infected trees is recommended. Long narrow strips should be avoided. Borders of clearcut units should incorporate natural and manmade barriers to prevent or slow reinvasion. Barriers can include small natural openings in stands, meadow edges, timber type species changes, uninfected edges of the same timber type, rock outcrops, streams, lakes, roads, powerlines, and adjacent clearcuts. These barriers should be about one half chain (33 feet) wide. Clearcut boundaries should be located in bottoms rather than on ridges. If these clearcutting parameters cannot be met, then the infected boundaries should be moved back or removed before the regeneration is 3 feet tall or 10 years old, to minimize infection in the new reproduction.

In mature stands heavily infected by DM, any type of partial cutting, thinning, or cleaning is likely to intensify the infection and increase the growth loss as mentioned above. Dwarf mistletoe will begin to reduce the growth rate of trees which have a DMR of 3 or greater. A stand with an average DMR over 2 will begin to have significant losses due to growth loss and mortality. The stand DMR will increase about one DMR class every 14 years.

Do not confuse DM brooms with stimulation brooms caused by increased sunlight or by comandra rust.

Favor apparently rust-free trees when thinning.

Control of DM can be funded by timber sale, KV, Reforestation and Stand Improvement, and FPM funds (FSM 3462.14, R-4 Supp-3). The following treatments (listed by priority of treatment funded by FPM) will provide a clean stand during the next rotation. Areas are listed as "Stand-Unit Number" and are located in Figure 1.

1. Remove residuals and any pockets or islands of infected LPP trees in all units where the regeneration is less than 3 feet tall or 10 years old.

AREAS: 3-22, 2-21, 1-25, 6-12, and along the road between 6-12 and Pelton 1.

2. Clean the infected LPP overstory surrounding units between 10 and 20 acres in size where an adjoining clearcut will not be scheduled before the LPP regeneration is 3 feet tall or 10 years old. Treatment should not be an extension of the clearcut boundary. A sanitizing treatment should be scheduled 5 years after the clearcut to remove latent and suppressed infection. Any of the following recommendations can be included:

a. Remove infected LPP along the perimeter next to areas that can provide a barrier after their removal (ponds, open areas, roads, etc.).

b. Remove or kill the infected LPP back 30 feet from the edge where one half or more of the trees are non-host species. The remaining overstory trees provide a barrier from DM seeds. Trees can be removed during or just after the clearcut as a separate cutting treatment or killed before the regeneration becomes infected. Felling is preferred to poisoning or girdling because it guarantees trees will be killed. Trees effectively girdled with a chain saw are not wind-firm and will fall at random.

c. Remove scattered infected LPP along the perimeter to create an even edge next to the regeneration.

d. Where units are replanted, the 50-foot edge next to the infected LPP trees can be planted with a non-host species or the planting of the edge can be delayed, providing the natural LPP regeneration will not interfere. A non-host species can be planted in areas of natural LPP regeneration and the LPP in the 50 foot strip can be removed during the thinning entry.

e. When thinning young stands, leave a dense barrier of trees within one half chain (33 feet) from the infected LPP overstory. This barrier should be sanitized 5 years after the infected LPP is removed. The trees will become infected with any treatment. Favor a non-host species if the edge is thinned.

f. A strip of LPP regeneration extending about one half chain (33 feet) into the regeneration unit can be removed when the infected LPP overstory trees next to the unit are removed. This will remove a large percentage of regeneration in a small unit.

AREAS: Pelton 1-86.

3. Stand destruction and replacement of severely infected stands (DMR 5-6) which occur on productive sites in the forest timber base, but which have no management potential because of DM infection.

AREAS: 4-13 and 3-14 where young residuals infected the regeneration.

4. Sanitation thinning: In areas with LPP trees over 3 feet tall and 10 years old, the DM infection levels should be reduced by sanitation thinning about 5 years after the infected LPP overstory removal. This will allow for expression of hidden latent or suppressed infection. Dwarf mistletoe infection levels in the regeneration should be reduced during precommercial thinning.

AREAS: in parts of 6-20 and 5-19.

5. Schedule clearcuts adjacent to units less than 20 acres in size and before the regeneration is 3 feet tall or 10 years old. The areas between or next to long narrow units should be treated first.

AREAS: 7-25 in compartment 046 (not shown on Figure 1.)

6. Treat the infected edges of units over 20 acres before the regeneration is 3 feet tall or 10 years old. The DM infection levels on the edges can be reduced with small clearcuts or by using any of the recommendations listed in Treatment 2. The clearcuts should remove infected LPP trees in narrow strips between units, next to narrow fingers of regeneration, and peninsulas extending into the regeneration.

AREAS: South end of Study Area, East side of 2-27, NW and SE side of 3-22, N side of 6-20, remove peninsulas in 3-14 and 3-28, and between 6-20 and 5-19, .

7. Do nothing in clearcut units greater than 20 acres in size with circular boundaries without any infected residuals, or in mature stands heavily infected with DM where clearcutting is not an option.

The "Flow Chart" (see Exhibit 1, FSM 3462.12--2, 3/83 R-4 Supp. 3) can be used to determine which treatment method should be used in areas not mentioned.

ACKNOWLEDGEMENT

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LITERATURE CITED

Hawksworth, F.G. 1977. The 6-class dwarf mistletoe rating system. USDA Forest Service General Technical Report RM-48. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 7 p.

REFERENCES

Hawksworth, F.G. 1961. Dwarfmistletoe brooms and other brooms in lodgepole pine. USDA Forest Service Research Note RM-59. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 11 p.

Hawksworth, F.G. and D. Wiens. 1972. Biology and classification of dwarf mistletoes (Arceuthobium). USDA Forest Service Agricultural Handbook No. 401. Washington, D.C. 234 p.

Hawksworth, F.G. and O.J. Dooling. 1984. Lodgepole pine dwarf mistletoe. USDA Forest Service Forest Insect and Disease Leaflet No. 18. 11 p.

Scharpf, R.F. and J.R. Parmeter, Jr. Technical Coordinators. 1978 April 11-13. Proceedings of the Symposium on dwarf mistletoe control through forest management. USDA Forest Service General Technical Report PSW-31. Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 190 p.